

ORIGINAL



SOUTHWEST GAS CORPORATION



0000162727

RECEIVED

2015 MAR 31 A 9:19

AZ CORP COMMISSION
DOCKET CONTROL

March 31, 2015

Docket Control
Arizona Corporation Commission
1200 West Washington Street
Phoenix, AZ 85007-2996

Re: **Docket No. G-01551A-04-0876; Decision No. 68487**

Pursuant to Commission Decision No. 68487 in the above referenced docket and subsequent discussions with the Arizona Corporation Commission Staff (Staff), Southwest Gas Corporation (Southwest Gas) hereby submits for filing an original and thirteen copies of Southwest Gas' Arizona Research 2014 Summary Report and 2015 Allocation Plan (Plan).

Finding of Fact No. 37 of the Decision states, "Gas Research should be funded at the level recommended by Staff, but Southwest Gas should have the flexibility, subject to Staff oversight, to select appropriate entities for use of the research funds." The submitted Plan provides a list and description of the research programs to be funded by Southwest Gas between April 2015 and March 2016. In addition, the Plan includes projects funded between April 2014 and March 2015.

Representatives from Southwest Gas met with Staff on March 17, 2015, to provide a general update on Southwest Gas' R&D activities over the past year and planned projects for the upcoming year.

If you have any questions or require additional information, please contact me at 602-395-4058.

Respectfully submitted,

Matthew Derr
Regulatory Manager/Arizona

Cc: Steve Olea, ACC Utilities Division
Bob Gray, ACC Utilities Division
Brian Bozzo, ACC Compliance Manager
Julie McNeely-Kirwan, ACC Utilities Division
David Tenney, RUCO

Arizona Corporation Commission

DOCKETED

MAR 31 2015

DOCKETED BY	
-------------	--



Southwest Gas Arizona Research 2014 Summary Report & 2015 Plan

Description	Apr. '14 - Mar. '15 Funding
ACC approved Research and Development funding	\$688,712
Operational Technology Development (OTD)	
-OTD Annual fee \$330,155	\$ 485,187
-Ref. No 27- Supplemental OTD funding \$155,032	
NYSEARCH	
-OTD Annual fee \$40,353	\$ 157,064
-Ref. No 19- Leak Pinpointing \$11,479	
-Ref. No 20- Trenchless Repl. \$12,216	
-Ref. No 21- MFL Sensor on bends \$68,785	
-Ref. No 22- Critical Valve \$7,612	
-Ref. No 23- Impact of Gasoline on PE \$12,161	
-Ref. No 25- Oracle \$4,458	
Other	
-Ref. No 26- Temperature Study \$35,455	\$ 46,461
-Ref. No 27 Picarro Surveyor \$11,006	
Total Dollars Allocated	\$ 688,712
Available Dollars	\$ -

Description	Apr. '15 - Mar. '16 Funding
ACC approved Research and Development funding	\$688,712
Operational Technology Development (OTD)	
-OTD Annual fee \$330,155	\$ 330,155
NYSEARCH	
-OTD Annual fee \$40,353	\$ 61,315
-Ref. No 24- Hardness Testing \$15,962	
-Ref. No 25- Oracle \$5,000	
Other	
-Ref. No 26- Temperature Study \$60,000	\$ 170,052
-Ref. No 27 Picarro Surveyor \$110,052	
Total Dollars Allocated	\$ 561,522
Available Dollars	\$ 127,190



**Southwest Gas Arizona Research
2014 Summary Report & 2015 Plan
April 1, 2015**

Ref. No	Organization/Project Name (OTD) Program	Research Performer	Project Description	Potential Benefits to AZ Customers	Status	Apr. '14 - Mar. '15 Funding	Apr. '15 - Mar. '16 Funding
	Dues (Project Allocation and Administrative Costs) Carry over from previous year Refunds/Royalties:				Subtotal OTD Allocation	\$485,187 -\$20,444	\$330,155 -\$19,994
					Total Available for Allocation	\$0	\$0
					Note: 2014-2015 total available for allocation and OTD administrative costs includes the \$155,032 additional OTD funds	\$464,743	\$310,161
	OTD Administrative Costs	Gas Technology Institute (GTI)				\$38,815	\$26,412
1	(1.14.h) Picarro Surveyor Winter Patrol Implementation	Picarro and GTI	Demonstrate that the use of Picarro Surveyor™ enhances the effectiveness and efficiency of winter leak patrols in identifying cast iron main breaks due to freeze conditions. Also, develop the protocols for optimizing the mix of traditional survey methods and Picarro Surveyor™ to ensure maximal survey coverage and effectiveness	This project has a safety benefit: Enhance the cycle time to complete leak surveys and the expected increase in the effectiveness of surveys will directly enhance public safety.	Project task 1, which includes installation of the Picarro equipment, has been started. Picarro will provide training to operators for 2 days on proper surveying and driving techniques.		\$7,336
2	(2.11.m) Identification of Non- Conforming High-Density Polyethylene (HDPE) Pipe	GTI	Develop prototype inspection tools that will identify non-conforming small diameter HDPE services. One tool will be used by field crews on exposed pipe to make a determination on whether the HDPE pipe is non-conforming. The second tool will be used by field crews on unexposed pipe. This internal inspection tool will be inserted into live gas mains or services to remotely determine if the HDPE pipe is non- conforming.	This project has a safety benefit: Identification and removal of non-conforming small diameter HDPE pipe services.	Phase 3. Develop an Internal Inspection Tool using ultrasonic technology (UT). Testing began on data collection from the UT hardware and display of the results with a LabVIEW program. Although some B-scan results are consistent with the expectations that were obtained, problems with data transmission were found. A consultant was hired to solve these problems. Work on other aspects of the tool has been put on hold until the software issues are resolved. Phase 4. Adapt commercial UT instrumentation for use as an External Inspection Tool. Two Southwest crew members were trained the week of October 20, 2014. The initial response was positive. Both UT units were tested and a modest sample collection program was implemented as the first step in analysis of the tool. The next step is getting crew feedback and selecting which unit to use.	\$386,036	\$250,000



**Southwest Gas Arizona Research
2014 Summary Report & 2015 Plan
April 1, 2015**

Ref. No	Organization/Project Name	Research Performer	Project Description	Potential Benefits to AZ Customers	Status	Apr. '14 - Mar. '15 Funding	Apr. '15 - Mar. '16 Funding
3	(2.14.d) Universal Polyethylene (PE) Entry Fitting	GTI and Georg Fischer Central Plastics (GFCP)	Develop a standardized PE entry/lateral fitting based on a split coupling/full-bore tapping tee concept. Refine the concept to practice, fine-tune the design and validate performance.	This project has safety and economic benefits: Reduce the costs of fitting for camera insertion, stopping the flow of gas and making repairs.	Georg Fischer Central Plastics (GFCP) developed a market survey to determine the needs and priorities of the project sponsors and potential applications in which a universal PE entry fitting could be used. The survey results indicated that a 2-inch IPS fitting had the highest priority.	\$3,669	
4	(2.14.e) Guidelines/Best Practices for Scraping Polyethylene (PE) Pipe and Fittings	GTI	To develop a functional set of improved, up-to-date guidelines for PE pipe and fittings that takes into account current tooling and practices while addressing the variables associated with fusion execution. This investigation and the resulting guidelines will create a greater understanding of the variables and practices which will lead to better fusion consistency/performance.	This project has safety and economic benefits: Enhancement of fusion execution for better consistency in performance.	A survey will be developed to identify the tooling and equipment used by various sponsors during scraping and fusing operations. Once information on the tooling is received, GTI will begin to develop the test matrix for the various tools.	\$3,669	\$923
5	(3.14.a) Soil Compaction Supervisor Enhancements	GTI/MBW Inc.	Upgrade the capabilities of the Soil Compaction Supervisor tool for compatibility with modern Geographic Information System (GIS) data capture practices, as well as making it user friendly with better data logging and reporting capabilities. Also determine the Tool's ability to be correlated to a standard proctor value or range.	This project has safety and economic benefit: Ensure that compaction is being performed properly (quality control) and enabling a utility to validate proper compaction.	GTI met with MBW Inc. to discuss the workflow and the communication protocol between the Mobile Device and Soil Compaction Supervisor (SCS). GTI mapped and documented based on use case scenarios and domain object diagram, the Architectural solution. GTI held a Webinar to discuss the workflow, communication protocol and inform the sponsors about the underlying technology approach for the solution. GTI started to work on the software solution for the logging of SCS data to the Mobile Device	\$7,337	\$2,623
6	(4.13.a) Distribution Integrity Management Program (DIMP) Consequence Model	GTI	To develop a model that quantifies the consequence of failure for distribution systems and DIMP based on factors such as: population density, proximity of critical infrastructure and business districts, failure mode based on material properties, gas migration patterns, soil and surface conditions, pressure and potential energy.	This project has a safety benefit A DIMP consequence model will enhance compliance and reduce system risk by assisting operators in understanding the risk of specific pipe segments based on the consequence of failure. This model will assist in prioritizing replacements as well as the deployment of other mitigation techniques.	Final Report for the project has been issued by GTI. The consequence model was validated against hundreds of incidents recorded by Pipeline and Hazardous Materials Safety Administration (PHMSA) over the last several years. These incidents' consequences were quantified in the same manner as was done in the consequence model. The results of the validation indicate that the consequence model indeed has predictive power and the ability to properly quantify expected - and 95% worst-case scenario outcomes - given the proper input.	\$1,541	



**Southwest Gas Arizona Research
2014 Summary Report & 2015 Plan
April 1, 2015**

Ref. No	Organization/Project Name	Research Performer	Project Description	Potential Benefits to AZ Customers	Status	Apr. '14 - Mar. '15 Funding	Apr. '15 - Mar. '16 Funding
7	(4.13.d) Hydro-Testing Alternative Program - Phase 2 and 3	GTI	This project is Phase 2 of the program and will identify and validate inspection and assessment technologies that are equivalent to a 1.25x Maximum Allowable Operating Pressure (MAOP) hydro-test for post-construction defects. Phase 2 will collect the data required to validate the ability of Magnetic Flux Leakage (MFL), Acoustic Resonance Technology (ART), Electro-Magnetic Acoustic Transducer (EMAT), and Guided Wave Ultrasonic Testing (GWUT) to find any defects.	This project has safety and economic benefits: Reduce the cost of retesting pipelines that have been using historic operating pressure to establish MAOP.	<ul style="list-style-type: none"> The preparatory work for developing the calculator was started. The data from the previous phase was sorted and reviewed The calculation methods that will underpin the calculator were reviewed Potential programming platforms were reviewed – the current preference is to use Mathematica to produce a calculator Further review of the literature to identify useful supporting methods was undertaken. 	\$13,024	\$4,294
8	(4.14.c) Surface Indentation for Material Characterization Correlation of Surface Properties Based on Vintage	GTI	Develop correlation factors to relate surface properties to actual material properties in order to allow surface indentation techniques to be used for material property validation for pipelines. The correlation factors will be based on pipe vintage by decade. The results will allow operators to use surface indentation techniques by applying the correlation factors to pipe materials that may have through wall variability.	This project has safety and economic benefits: Reduce the cost in determining the pipe material properties (e.g. strength) of steel pipe for pipeline integrity purposes.	GTI continued working on the literature search for the project. Over 75 key published papers have been identified, as well as other reference material related to the project subject. Samples from previous research efforts suitable to this project have been and continue to be analyzed. The model identified previously, relating chemistry and grain size to yield and tensile strength, continued to be validated through data collected from the samples noted above. Testing protocols are being initiated and established in preparation for the next task of this project.	\$7,337	\$6,922
9	(5.11.p) Smart Grid Initiative Standards and Regulations – Phase 2	GTI	Ensure that the infrastructure requirements that are specific to the natural gas industry are included in the ongoing technology, standards, and regulatory initiatives currently focused on the electric smart grid initiative.	This project has a safety benefit: Enhanced system reliability, improved cost-effectiveness to customers, and increased system safety for both the electric power and gas industries.	Recent effort has focused on determining the best path forward in developing recommendations for an Automatic Meter Reading (AMR)/Advanced Meter Infrastructure (AMI) compatible pressure monitoring device. These recommendations would then be reviewed by manufacturers and service providers as the foundation for a standard. The draft standard would then be submitted to the Smart Grid Interoperability Panel (SGIP) for further review. The end product of this effort is that the standard developed for the pressure monitoring device will be included in the SGIP Catalog of Standards. This standard will also serve as the template for other smart sensors that can be integrated into gas AMI systems.	\$2,001	
10	(5.14.a) Radio-Frequency Identification (RFID) Testing Program	GTI	To conduct a testing program to compare the performance and features of multiple RFID tag solutions for locating and tracking underground assets.	This project has a safety benefit: Enhancement of locating and tracking natural gas underground assets.	The below ground tag installation and first round of testing was completed. At this time all the data has been captured in wet/cold conditions. Two out of the three tag types are performing as per the manufacturers' specification. The one exception appears to be the result of a manufacturing flaw in the housing that allowed the entry of water. Testing is still on-going.	\$3,669	\$2,514



**Southwest Gas Arizona Research
2014 Summary Report & 2015 Plan
April 1, 2015**

Ref. No	Organization/Project Name	Research Performer	Project Description	Potential Benefits to AZ Customers	Status	Apr. '14 - Mar. '15 Funding	Apr. '15 - Mar. '16 Funding
11	(5.14.c) Improving Cyber Security for Local Distribution Companies (LDCs) - Needs Identification Workshop	GTI	This project will identify the short and long range needs for cyber security capability improvement for LDCs through the use of a needs-identification workshop. The proposed workshop will identify and prioritize the critical cyber security technology needs, assessment methodologies and areas for capability improvement of LDCs. A report will summarize the outcome of the workshop.	This project has safety and economic benefits: Reduce the risk of any Cyber-attack to distribution system.	The final report for this project has been issued by GTI. GTI developed a six-step approach to immediately provide access to technologies available to transition to practice, develop a training program, and develop a strategy for the OTD cybersecurity program, and address the needs of asset management and detection. 1. Attend Department of Homeland Security (DHS) Demonstration Day - Technologies Available to Transition to Practice 2. Develop a natural gas utility specific cybersecurity training/education program 3. Evaluate regulations, standards and organizations involved in cybersecurity 4. Develop roadmap to address asset management 5. Evaluate partnership with DHS, SRI International and others 6. Develop proposal and program for cybersecurity R&D	\$3,669	\$11,005
12	(5.14.d) Tracking and Traceability for Transmission Pipe Materials	GTI	To develop standards, guidelines, and software for tracking and traceability of transmission pipe. The results of this project will provide the industry with a standardized approach for capturing pipe and coating data from the mill through an electronic database and unique identifiers applied with barcodes.	This project has safety and economic benefits: The ability to automate the process of capturing and storing tracking and traceability information for transmission pipe will improve data quality and reduce risk.	A preliminary set of data collection requirements was created and reviewed with Subject Matter Expert (SME) and updated based on feedback. GTI conducted two interviews with pipe manufacturers for pipe tracking and traceability including other industries to gather information about current practices for barcoding and labeling pipes and fittings designed for natural gas transmission systems.	\$3,669	\$3,354
13	(5.14.f) Methods to Detect Inserted Plastic in Steel Mains	GTI	To identify field-friendly methods to determine if a steel main is plastic inserted. The method needs to be external and not require a high level of training. If commercial devices are identified, initial feasibility testing of these will be performed.	This project has safety and economic benefits: Improved accuracy in pinpointing hard to find plastic pipe inserted in steel main. In addition, reduced costs and increased safety in operating distribution pipelines installed using the insertion method (inside steel main).	Experimental testing of impulse model analysis for detecting plastic inserts in steel gas main was undertaken. This method, being independent of gas flow, was seen promising for identifying inserts in the largest range of field conditions. Because gas flow in a main varies greatly (including zero flow), a method independent of gas flow would be preferable. Another practical consideration is that an apparatus capable of sustaining a reasonable rate of flow would require additional time and resources to set up.	\$4,621	
14	(5.15.e) Inspection Alert Tag for Critical Equipment	GTI	To develop a rugged electronic tag that can be attached to a fire extinguisher and possibly other inspection/calibration type devices used by utility crews to alert personnel when inspections are due. The inspection alert interval can be reset using a readily available handheld device such as a smart phone or other device.	This project has safety and economic benefits: Enhanced the tracking of inspections and/or calibrations of items used by field crews.	Project scoping, which includes kick-off meeting and contracting, will be started soon. The project investors will be solicited for input during this task on items such as type of inspection currently in use, acceptable form factor, cost and lifetime of the equipment tag.		\$3,668



**Southwest Gas Arizona Research
2014 Summary Report & 2015 Plan
April 1, 2015**

Ref. No	Organization/Project Name	Research Performer	Project Description	Potential Benefits to AZ Customers	Status	Apr. '14 - Mar. '15 Funding	Apr. '15 - Mar. '16 Funding
15	(5.15.f) No Stub Service Lateral Retirement	GTI	To develop a method of retiring a gas service or other lateral type fittings without leaving an extended stub on the gas main.	This project has safety and economic benefits: The development of such a tool and process will mitigate the potential for 3rd party damage during future excavations.	Project scoping, which includes project kick-off activities such as the sponsor kick-off call, contracting, sub-contracting, and other related activities, will be started soon.		\$3,668
16	(6.6.a) Keyhole Project	GTI	Keyhole technology provides access to buried pipelines through a hole approximately 18" in diameter. This small size has many advantages including lower excavation costs, fewer required resources, minimal impact and restoration to pavement. This program evaluates and demonstrates new applications for keyhole technology.	This project has an economic benefit: Reduced excavation and restoration costs.	The program continues to provide value and share ideas with the stakeholders while it also contributed to the acceptance and advancement of keyhole technology. Recent program accomplishments include the continued implementation of keyhole methods by utilities in North America and overseas, jurisdictional acceptances of the keyhole coring process, a Common Ground Alliance (CGA) Best Practice of vacuum excavation and low dig methods, resource sharing through a keyhole SharePoint site, the development of an interactive database of guidelines of keyhole methods, and the creation of keyhole videos to assist with training and implementation.	\$7,337	\$7,337
17	(6.8.a) Carbon Management Information Center (CMIC)	GTI	To collaborate with members from natural gas and propane companies to address industry issues and opportunities in the evolving arena of source efficiency and gas emissions.	This project has an economic benefit: Better understanding of the role of natural gas end-use equipment in reducing overall energy use.	GTI plans to continue a high level of focus in providing technical input to voluntary standards and regulatory initiatives developed and promulgated by other stakeholders. Continue American Society of Heating and Air-Conditioning Engineers (ASHRAE) and Residential Energy Service Network (RESNET) committee involvement. International Code Council (ICC) 700 National Green Building Standard revisions, interactions with state and federal government agencies, and related presentations and analytic efforts. Additional speaking engagements are expected as well to reinforce the message and information with gas industry members and outside stakeholders.	\$11,006	\$11,006



**Southwest Gas Arizona Research
2014 Summary Report & 2015 Plan
April 1, 2015**

Ref. No	Organization/Project Name	Research Performer	Project Description	Potential Benefits to AZ Customers	Status	Apr. '14 - Mar. '15 Funding	Apr. '15 - Mar. '16 Funding
18	(6.11. a) Pipeline Research Council International (PRCI) Membership	GTI	Membership in the PRCI program and full participation in their technical committees through GTI's OTD.	This project has an economic benefit: Provide more access to research materials that OTD and NYSEARCH have not addressed.	Below is a short list of reports that PRCI recently completed: • MAT-6-1 Quality of Electric Resistance Welding (ERW)/High Frequency Induction (HFI): Driven by a concern regarding the reliability of currently supplied ERW-HFI Pipe seam welded line pipe, PRCI wished to identify issues and ways of preventing problems from occurring during manufacture which could be incorporated in line pipe specifications. • ENV-6-1 Field Validation of Surface Loading Stress Calculations for Buried Pipelines: The objective for this two phase project was to validate surface loading criterion for pipelines with shallow burial. • American Petroleum Institute (API)-1-2 Guidelines for Interpretation and application of API 1104 - 21st Edition: The application of requirements contained in many industry codes and standards requires some interpretation by the user and by the regulator who is called upon to enforce their use. The objective of this project was to update the PRCI guidance document for API Standard 1104 - Welding of Pipelines and Related Facilities - for the recently published 21st Edition of the standard and to further develop the document.	\$7,337	\$7,337
NYSEARCH						\$484,737	\$348,399
OTD Balance Available						-\$19,994	-\$38,238
NYSEARCH Membership Dues						\$40,353	\$40,353
19	Leak Pinpointing Inside Pipe Phase 1	Bruce Campbell Consulting	The objective of this project is to develop an acoustic sensor device that can pinpoint leaks from inside the pipe. Their Phase 1 proposal includes system definition, proof-of-concept, laboratory testing of the sensor system and development of a field test plan.	This project has safety and economic benefits: Reduced costs in pinpointing leaks.	Task 1 has been started with a survey to solicit input from project funders. In this initial assessment the full range of required specific performance and cost parameters for the equipment design will be determined.	\$11,479	



**Southwest Gas Arizona Research
2014 Summary Report & 2015 Plan
April 1, 2015**

Ref. No	Organization/Project Name	Research Performer	Project Description	Potential Benefits to AZ Customers	Status	Apr. '14 - Mar. '15 Funding	Apr. '15 - Mar. '16 Funding
20	Trenchless Replacement of Small Diameter Steel Gas Service Lines	TT Technologies	The objective of the proposed Phase I program is to design, develop and test a new system for extracting small steel services, bare or wrapped in the size range of $\frac{3}{4}$ " - 1 $\frac{1}{2}$ " diameter to replace them with same size or larger size Polyethylene (PE) pipe. If successful for the smaller steel services, TT Technologies also envisions a Phase II to address steel services with diameters of 1 $\frac{1}{2}$ " and larger.	This project has an economic benefit: Reduced costs in replacing existing steel pipe services.	Task 1 has been started with a survey to solicit input from project funder. The survey will assist TT Technologies to design, develop, and test a new system for extracting small steel services, bare or wrapped, in the $\frac{3}{4}$ " - 1 $\frac{1}{2}$ " diameter range and replace them with the same size or larger PE service pipe	\$12,216	
21	Design, Construction and Testing of Magnetic Flux Leakage (MFL) Sensor for Inspection of Bends in Unpiggable Pipelines - Phase VII-b	Invodane	The work proposed by Invodane involves: (a) the laboratory testing of bend inspection using the existing MFL sensors in order to validate the results of the numerical studies carried out in the feasibility study, (b) implementing design changes to the magnetic bars to improve bend inspection capabilities, (c) testing the new magnetic bars on Explorer 20/26, (d) developing the algorithms to handle the data from such inspections, and (e) developing the sizing routines for defects in bends. The proposed work scope is divided into five tasks.	This project has safety and economic benefits: This project will allow us to add to the existing capabilities of the Explorer robots for the inspection of unpiggable pipelines.	The MFL sensor for bends will be initiated once the Explorer 6/8 MFL sensor concept and preliminary design is completed. The project is in conjunction with Explorer 6/8 MFL sensor projects.	\$68,785	
22	Critical Valve Operability	Bruce Campbell Consulting	The objective of the project is to develop a method of confirming valve position and provide validation of a critical valve operability test. Campbell Consulting has prior related experience testing valves using non-destructive examination (NDE) techniques employing acoustic emissions. Thus, Campbell has provided NYSEARCH a proposal to apply similar techniques to critical valve operability testing.	This project has a safety benefit: Enhanced valve inspection and reduce the risk of leaving a valve in a partially closed or more serious fully closed position.	NYSEARCH presented their proposed concept and explained the proposal by Bruce Campbell Consulting in using acoustic emissions detection application. NYSEARCH noted the unknowns for this acoustic emission approach including narrow access and limited contact with the valve through the valve box, and how the approach will differ for the plastic and steel materials	\$7,612	
23	Impact of Gasoline/Oil on Polyethylene (PE) pipe project	NYSEARCH	The objective of the project is to understand the impact of external contaminated soil conditions on the external surfaces of PE pipe and develop a practical engineering and operator's guideline that provides specific instructions for evaluating PE pipe found in contaminated soils.	This project has a safety benefit: Identify any potential integrity degradation of PE pipe exposed to heavy hydrocarbons.	The tasks in the proposed project address: 1) a more thorough evaluation of the existing body of knowledge, 2) gap analysis to determine what experimental tests need to be performed to understand effects of hydrocarbon contact to the external surface of PE pipe and 3) deliverance of a practical guideline to engage when PE pipe is found to be in contact with contaminated soils.	\$12,161	



**Southwest Gas Arizona Research
2014 Summary Report & 2015 Plan
April 1, 2015**

Ref. No	Organization/Project Name	Research Performer	Project Description	Potential Benefits to AZ Customers	Status	Apr. '14 - Mar. '15 Funding	Apr. '15 - Mar. '16 Funding
24	Hardness Testing - Feasibility Study with Robotic Platform - Phase II (M2011-008 Robotics Supporting Technologies, Phase IXb)	Invodane	This project will: (a) build a hardness tester integrated onto the Explorer 20/262 robotic platform for the inspection of natural gas unprogrammable pipelines, able to carry out hardness testing from the interior of a pipeline, and (b) demonstrate the ability to carry out such a test at the specification standards met by portable hardness testers available in the market today.	This project has safety and economic benefits: Reduce cost to carry out non-destructive testing of pipelines. The ability to carry out such non-destructive tests inline avoids hydro testing or expensive and disruptive excavations to carry out the same task from above ground.	The project kick off is expected to start 2nd quarter of 2015		\$15,962
25	ORACLE Program for Identifying Quantum Leap Technologies	NYSEARCH	The focus of this effort is the identification of new, emerging technologies in the areas of advanced sensors, sensory devices, and detection technologies, or the identification of mature or near-mature technologies in other technology areas (such as medical, aerospace, defense, and optics) that can be transferred to the gas industry and result in great improvements in the operation and maintenance of the gas distribution and transmission network.	This project has an economic benefit: Leverage emerging technology and adapt to gas distribution systems which can cut costs of research and development.	NYSEARCH funders identified three (3) areas of interest: Leak Detection, Damage Prevention and Pipeline Locating. TechFusion's initial search revealed (171) matching abstracts. Then NYSEARCH staff and funders performed (22) interviews, narrowing the selected invitations to four (4) final technologies. The four (4) technology presentations included description of technologies in two (2) specific areas of Leak Detection by EOS Photonics and Los Gatos Research (LGR). Intelligent Automation and Karagozian and Case presented technologies on damage prevention. The project funders rated the four (4) technology presenters for interest in pursuing a possible project(s). Based on the ratings it was determined that there is an interest in exploring the development of a more specific and high resolution gas detection through a possible combination of EOS Photonics and LGR technologies	\$4,458	\$5,000
Subtotal NYSEARCH Allocation						\$157,064	\$61,315

Other



**Southwest Gas Arizona Research
2014 Summary Report & 2015 Plan
April 1, 2015**

Ref. No	Organization/Project Name	Research Performer	Project Description	Potential Benefits to AZ Customers	Status	Apr. '14 - Mar. '15 Funding	Apr. '15 - Mar. '16 Funding
26	Temperature Study	Arizona State University (ASU)	To determine soil temperatures at burial depths for natural gas pipelines in Southwest Gas' operating territories and perform analytical and testing services regarding soils, underground temperature sensing, data gathering, data analysis and testing validation.	This project has a safety benefit: Better understanding of operating temperature conditions of underground facilities. Promote a safe and reliable distribution system.	All seven weather stations have been installed and are successfully collecting data. There are four locations in Arizona - Tempe, Tucson, Yuma and Bullhead City. Two locations in Nevada - Henderson and Carson City. One location in Barstow California. The temperature sensors were placed at depths of 6 inch, 24 inch, 36 inch, and 42 inch below the pavement and dirt. Moisture sensors were installed at depths of 6 inch, 24 inch, and 36 inch below the pavement and dirt. Each temperature station is self-sufficient as dual solar panels are used to generate power for the Data loggers. Monthly data collection will continue with sensor reading continuously taken at 5 minute intervals. Data from all sites will be monitored and downloaded once a week.	\$35,455	\$60,000
27	Picarro Surveyor Field Trial	SWG	To evaluate the use of Picarro Surveyor system for determining leaks. Picarro will provide the equipment, training, driving protocol and assist in the validation process.	This project has safety and economic benefits: Improved accuracy in pinpointing hard to find leaks. In addition, reduced costs in pinpointing leaks.	A project plan is being developed and the evaluation is expected to start in the 2nd quarter of 2015. Part of the evaluation will include an integration of leak information with SWG's GIS.	\$11,006	\$110,052
Subtotal Other Allocation						\$46,461	\$170,052

Apr. '14 - Mar. '15 Funding	Apr. '15 - Mar. '16 Funding
\$688,712	\$561,522
\$688,712	\$688,712
\$0	\$127,190

Total Dollars Allocated
Total Available Research Dollars
Available Dollars

General Notes:

- 1) Total authorized collection in Final Order is \$688,712 per year. Funding is collected in a deferred balancing account.
- 2) Proposed projects reflected in current or proposed funding year may change. Some projects may terminate pending progress or proposed projects may not materialize due to lack of support. In addition, research organizations meet and discuss new and existing projects at various times of the year - this document reflects projects and information as of the date of this document.
- 3) Actual allocation amount may change due to changes in projects described in 2 above or due to number of companies that ultimately fund a project.